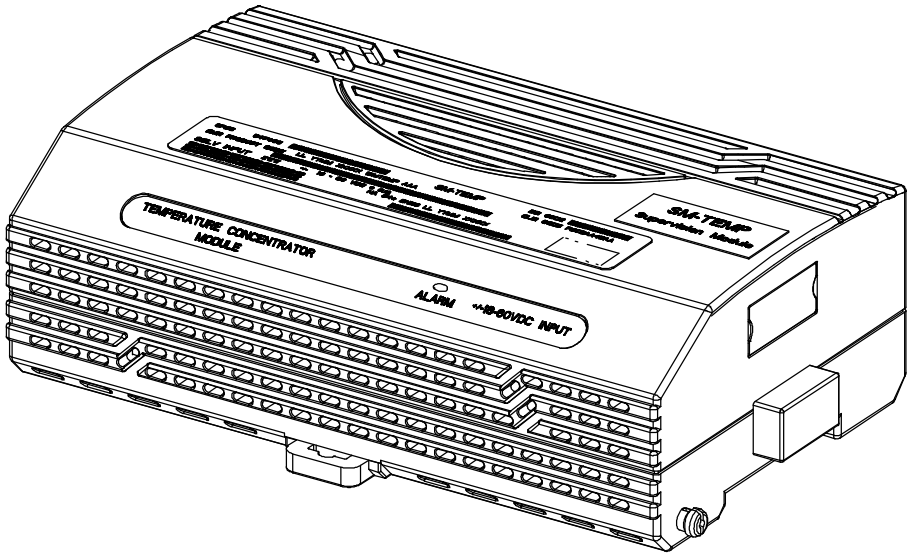
A technical manual from the experts in *Business-Critical Continuity*™

# SM-TEMP Temperature Concentrator

## Installation and User Manual

**UM547490 (Issue AF, March 8, 2012)**

**SPEC. NO.: 547490**

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# DESCRIPTION

This document provides specification, installation, and operational information for the SM-TEMP Temperature Concentrator that is designed for use in both -48V and +24V systems.

NetSure™ Power Systems can be operated in conjunction with one or more battery and/or ambient temperature probes. With a battery probe installed and connected, the power system is designed to automatically increase or decrease output voltage as battery temperature decreases or increases, respectively. This maintains an optimum charge voltage to the battery with respect to temperature, thereby extending battery life.

Each SM-TEMP module receives temperature inputs from up to 8 solid-state temperature sensors (AD592B type). These are the same temperature sensors currently connected to the temperature inputs of the SCU, SCU+, ACU, and ACU+ controllers.

The SM-TEMP module provides a 125 kbps CAN output of the temperature of all connected sensors. There are address DIP switches to allow up to eight (8) SM-TEMP modules to operate concurrently on the same CAN bus.

The SM-TEMP module provides an analog output of the average or the maximum (DIP switch configurable) of the temperatures of the connected sensors. The output is a current source providing 1 µA/K. The output is compatible with the temperature port input of the SCU, SCU+, ACU, and ACU+ controllers. When multiple SM-TEMP modules are used, the analog output of only one of the SM-TEMP modules is connected to the controller's temperature port input.

When used with an ACU+ (version 3.02 or later), in lieu of connecting the analog output of the SM-TEMP module to an ACU+ temperature port input, the SM-TEMP module can simply be connected at the end of the ACU+ CAN bus. Via the CAN bus, the ACU+ reads each temperature probe from each SM-TEMP module.



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# SPECIFICATIONS

## Electrical

**Input Voltage:** ±18-60 volts DC

**Input Current:** 0.1 Amps

**Input Protection:** Internal 3 ampere fuse, not user replaceable. An external 1-1/3 ampere fuse should be user-provided in the ungrounded input conductor.

## Environmental

**Operating Ambient Temperature Range:** -40°C to +70°C (-40°F to +149°F)

**Temperature Measurement Range:** -25°C to +105°C (-13°F to +221°F)

**Storage Ambient Temperature Range:** -40°C to +85°C (-40°F to +185°F)

**Humidity:** Capable of operating in an ambient relative humidity range of 0% to 95%, non-condensing

**Altitude:** Will operate at any elevation between sea level and 10,000 ft.

## Accessories

***Note:*** *This information is provided for reference. Refer to power system documentation when ordering these accessories.*

- **Battery Temperature Probes**

  Temperature probe kits are ordered separately.

  3 meter – P/N 547749

  10 meter – P/N 547750



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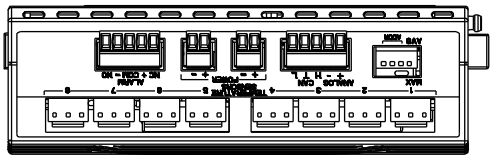
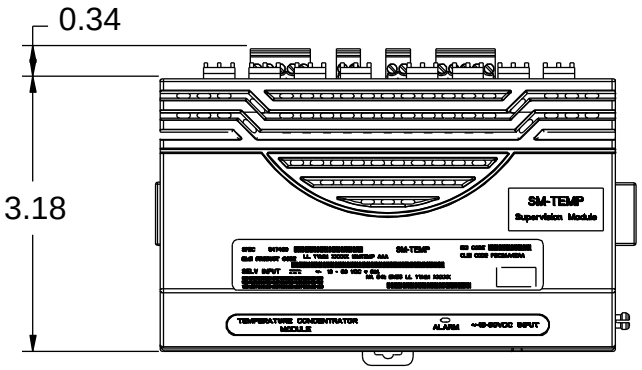
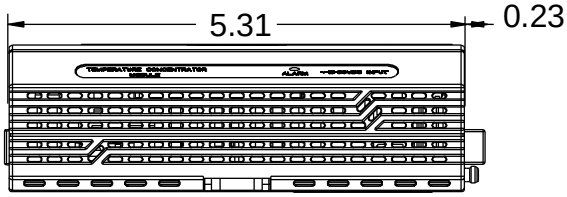
## Dimensions



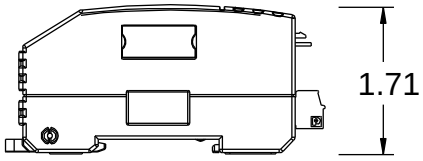
REAR VIEW



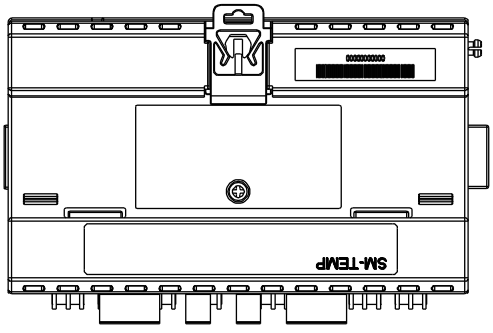

TOP VIEW




FRONT VIEW




RIGHT SIDE VIEW




BOTTOM VIEW

Figure 1
Dimensions (in inches)



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# INSTALLATION

## Safety Statement

***DANGER:*** ***Installation of this equipment should only be performed by a qualified installer following approved safety procedures.***

***This equipment is used in conjunction with batteries. Batteries are an energy source that can produce high amounts of electrical current. NEVER allow a metal object, such as a tool, to contact more than one termination at a time, or to simultaneously contact a termination and a grounded object. Even a momentary short circuit can cause an explosion resulting in injury. To avoid such short circuits and injury:***

- ***Wear eye protection at all times.***
- ***Remove watches, bracelets, and rings.***
- ***Use only tools having insulated handles.***
- ***If insulated tools are not available, completely cover tool handles with a minimum of three half-lapped layers of electrical tape.***
- ***Ensure that wrenches with more than one working end have only one end exposed.***

## User Selections (Switch S1)

See Figure 2 for location of switch S1.

| Position | Function |
|---|---|
| 1 | Compensation Mode (for SM-TEMP Analog Output) (Maximum / Average Temperature) |
| 2 | CAN Address (switch position #2 sets the most significant bit, switch position #4 sets the least significant bit) |
| 3 | |
| 4 | |

Table 1
S1 Output Mode Switch Settings

***Note:*** *Up to eight (8) SM-TEMP modules may be connected together via a CAN bus. Use switch positions 2 – 4 to give each module a unique address. See Table 2.*

| SM-TEMP Module # | Switch Positions | | |
|---|---|---|---|
| | **2** | **3** | **4** |
| 1 | 0 | 0 | 0 |
| 2 | 0 | 0 | 1 |
| 3 | 0 | 1 | 0 |
| 4 | 0 | 1 | 1 |
| 5 | 1 | 0 | 0 |
| 6 | 1 | 0 | 1 |
| 7 | 1 | 1 | 0 |
| 8 | 1 | 1 | 1 |

Table 2
SM-Temp CAN Bus Addressing



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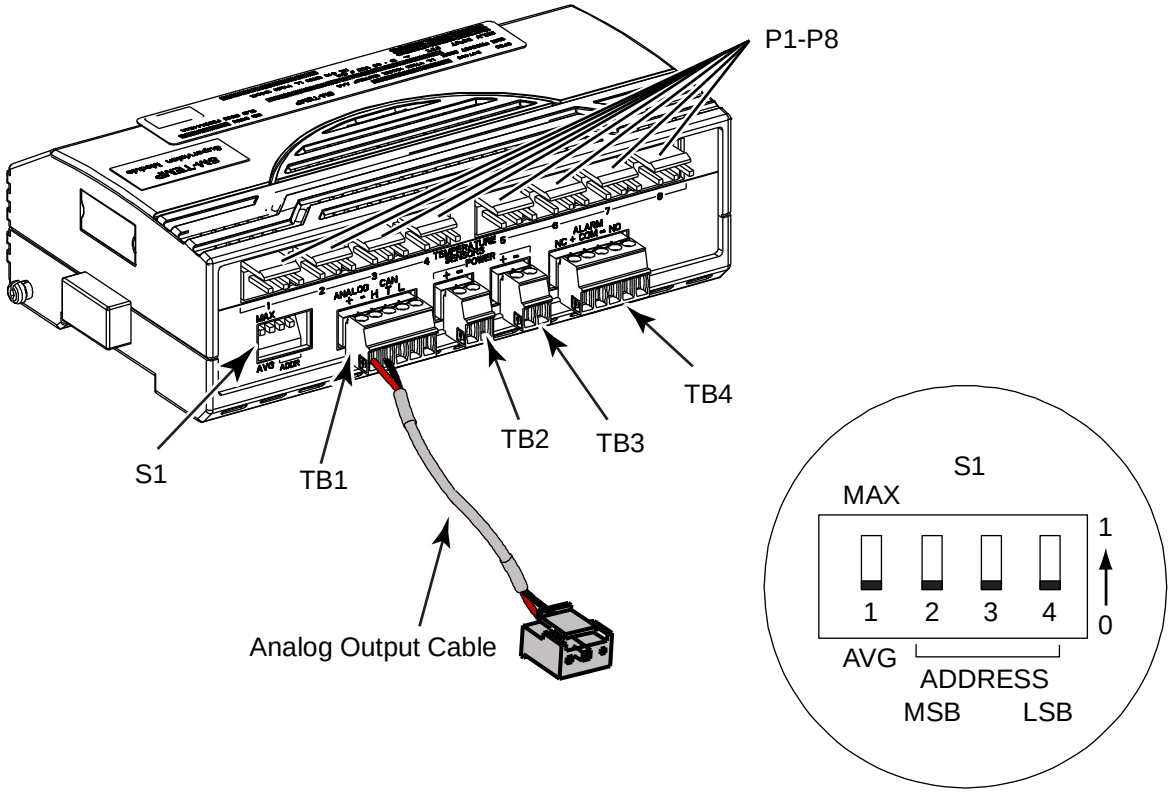


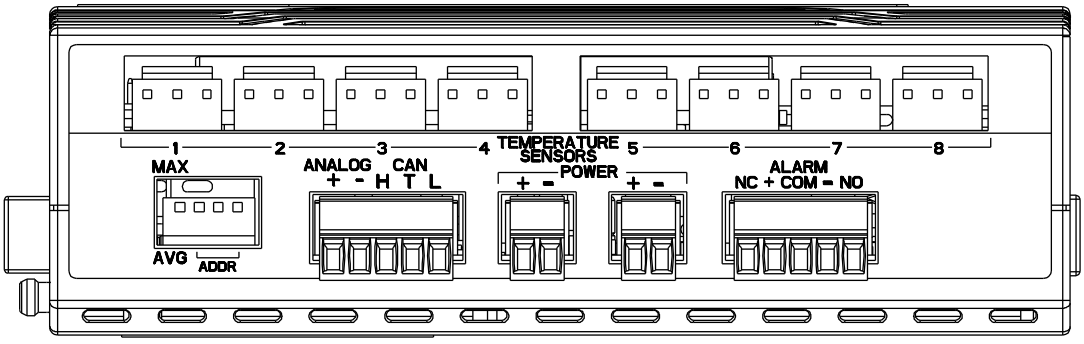


Rear View

Figure 2
Connector Locations

## Mounting

### Mounting the SM-TEMP

A 6” DIN rail, P/N 116765, is included with each module.

### Mounting the Battery Temperature Probes

***Danger: Read the Safety Statement at the beginning of the Installation section before mounting the probes.***

Refer to power system documentation for mounting guidelines.



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## Electrical Connections

Refer to Figure 2 for connector locations.

### General

- CAN bus and analog output connections are made to TB1. TB1 provides screw compression type terminals, which accept a wire size of 28-16 AWG. Strip 1/4" of insulation from each lead; insert the lead in the wire cavity and tighten the screw. Recommended torque is 2 in-lbs.
- Power connections are made to terminal blocks TB2 or TB3 (the other terminal block is available to feed this power to other SM-TEMP units or other SM modules). TB2 and TB3 provide screw compression type terminals, which accept a wire size of 28-16 AWG. Strip 1/4" of insulation from each lead; insert the lead in the wire cavity and tighten the screw. Recommended torque is 2 in-lbs.
- Alarm connections are made to terminal block TB4. TB4 provides screw compression type terminals, which accept a wire size of 28-16 AWG. Strip 1/4" of insulation from each lead; insert the lead in the wire cavity and tighten the screw. Recommended torque is 2 in-lbs.
- The SM-TEMP receives temperature information from temperature probes. These are the same types used with the power system controllers (ACU, ACU+, SCU, or SCU+) when the SM-TEMP is not present. The temperature probes plug into the eight connectors on the top row on the back of the SM-TEMP (P1 – P8). Temperature probe connections are made by means of locking-plug type connectors.

### Input Power

***Note:*** *Observe correct polarity. The + side of the power input (ground in a -48V system, battery in a +24V system) goes to the + terminal, while the – side of the power input goes to the – terminal. Provide an external 1-1/3A fuse in the ungrounded input lead.*

Connect power from a distribution fuse to either one of the two terminal blocks (TB2 or TB3).

1) Connect positive (+) battery to terminal 1 of TB2 or TB3.
2) Connect negative (–) battery to terminal 2 of TB2 or TB3.

### External Fail Alarm

Alarm contacts are rated for 0.5A at 125VAC, 1A at 30VDC, and 0.3A at 110VDC.

***Note:*** *<u>Do not</u> apply voltages higher than 42.4 volts AC (peak) or 60 volts DC.*

In the event of an alarm condition, a closed loop circuit will be provided between terminals 3 and 5 of terminal block TB4, and an open loop circuit will be provided between terminals 1 and 3 of TB4. Refer to Figure 3 for alarm configurations.

### Probes

Plug the Battery Temperature Probe(s) into connectors P1-P8 on the SM-TEMP. Probe locations can be recorded on the label provided on the SM-TEMP.



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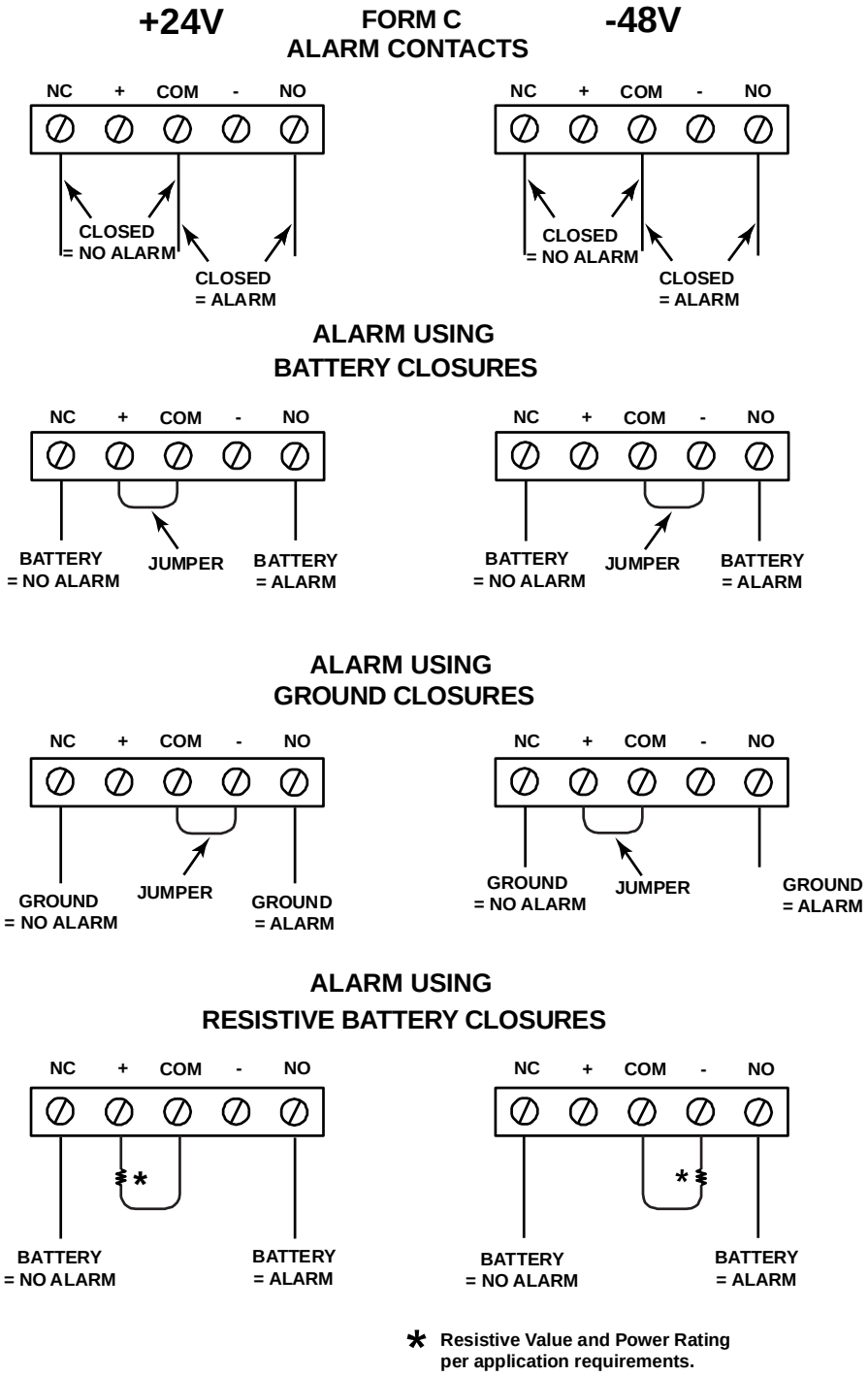


Figure 3
Alarm Wiring (TB4)



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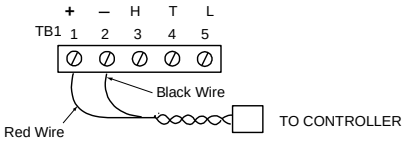
## Interface Connection to the Power System

a) **When connected to a Controller's Temperature Port Input**

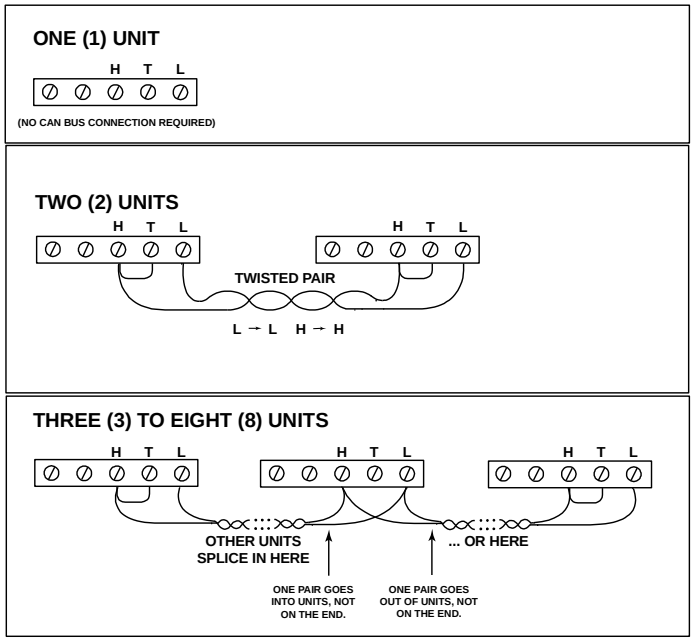
The SM-TEMP module is designed to interface with the following Controllers: ACU, ACU+, SCU, SCU+. Use cable P/N 547565 (shipped loose with each unit).

- The analog output connections are made to TB1 pins 1-2. Refer to Figure 2 and Figure 4. When multiple SM-TEMP modules are used, the analog output of only one of the SM-TEMP modules is connected to the controller's temperature port input.
- CAN bus connections are made to TB1 pins 3-5. See Figure 4 for correct CAN bus wiring.

ANALOG OUTPUT CONNECTION
(when connecting the SM-TEMP analog output
to the Controller's temperature sensor port
and not connecting into the Controller's CAN bus)




CAN BUS INTERCONNECTIONS
(when connecting the SM-TEMP analog output
to the Controller's temperature sensor port
and not connecting into the Controller's CAN bus)




**DO NOT WIRE THE TEMP CONCENTRATOR THIS WAY (STAR TOPOLOGY)**

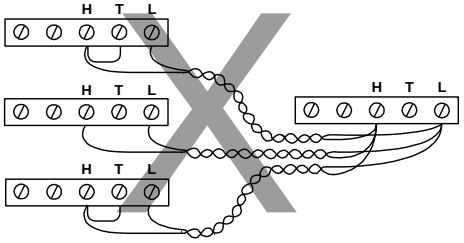



Figure 4
SM-TEMP Connections
(when connecting the SM-TEMP analog output
to the Controller's temperature sensor port
and not connecting into the Controller's CAN bus)



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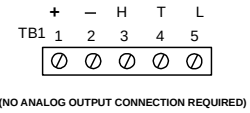
b) **When connected into the ACU+ CAN Bus**

When used with an ACU+ (version 3.02 or later), in lieu of connecting the analog output of the SM-TEMP module to an ACU+ temperature port input, the SM-TEMP module can simply be connected at the end of the ACU+ CAN bus.

- The analog output connections ARE NOT REQUIRED.
- CAN bus connections are made to TB1 pins 3-5. See Figure 5 for correct CAN bus wiring.

ANALOG OUTPUT CONNECTION NOT REQUIRED
(when connecting the SM-TEMP to the Controller's CAN bus
and not connecting the SM-TEMP analog output
to the Controller's temperature sensor port)




CAN BUS INTERCONNECTIONS
(when connecting the SM-TEMP to the Controller's CAN bus
and not connecting the SM-TEMP analog output
to the Controller's temperature sensor port)

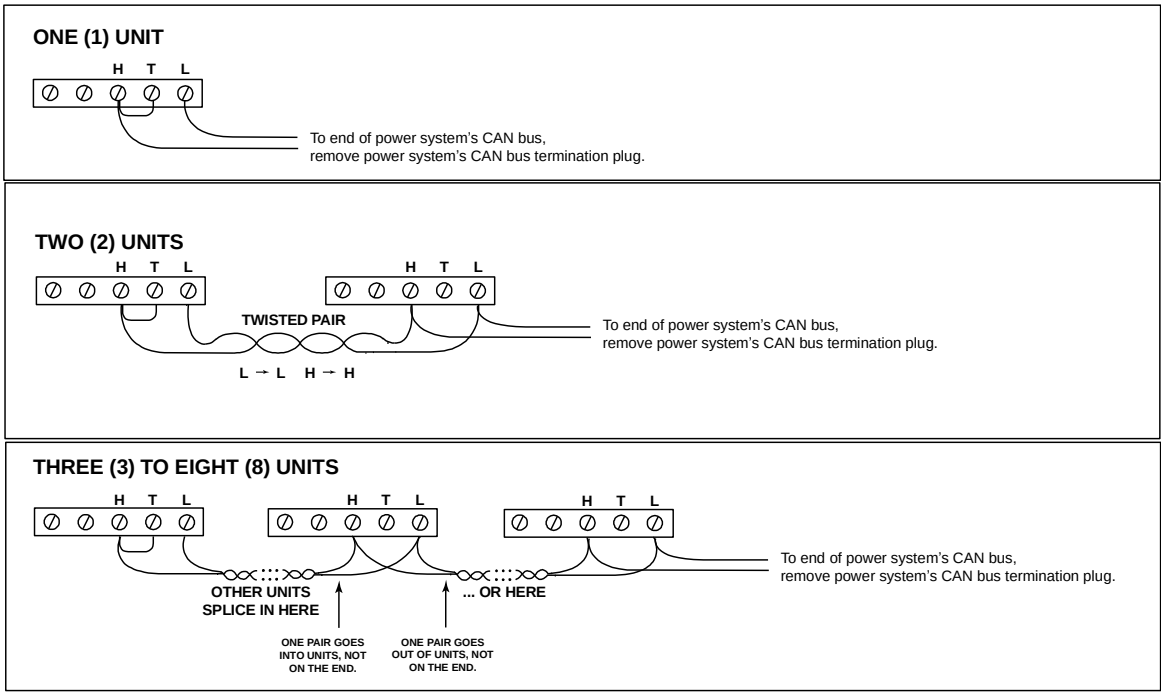

ONE (1) UNIT
H T L
To end of power system's CAN bus,
remove power system's CAN bus termination plug.
TWO (2) UNITS
H T L
H T L
TWISTED PAIR
To end of power system's CAN bus,
remove power system's CAN bus termination plug.
L → L H → H
THREE (3) TO EIGHT (8) UNITS
H T L
H T L
H T L
To end of power system's CAN bus,
remove power system's CAN bus termination plug.
OTHER UNITS
SPLICE IN HERE
... OR HERE
ONE PAIR GOES
INTO UNITS, NOT
ON THE END.
ONE PAIR GOES
OUT OF UNITS, NOT
ON THE END.

Figure 5
SM-TEMP Connections
(when connecting the SM-TEMP to the ACU+ CAN bus
and not connecting the SM-TEMP analog output
to the ACU+ temperature sensor port)



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## Initially Starting and Checking Operation

After all electrical connections have been made and verified, perform the following procedures to start and verify SM-TEMP operation.

### Initial Startup

1) With the Power System operating, verify that the STATUS LED on the SM-TEMP is continuously illuminated GREEN.
   a) If the STATUS LED does not illuminate, check for correct voltage and polarity at terminals 1 and 2 of TB2 and / or TB3 on the SM-TEMP.
   b) If the STATUS LED illuminates continuously RED, the SM-TEMP has failed. Replace the SM-TEMP.
   c) If the STATUS LED flashes red, update the temperature probe inventory by cycling output mode switch 1 (the left-most switch) three times in rapid succession. This should restore the STATUS LED to continuous green illumination. Note that any alarms for open temperature probes will be permanently lost.
   d) If the STATUS LED flashes green, CAN address switches 2-4 on two SM-TEMP units connected by single CAN bus are set to the same address. Changing the switch settings on one of the affected SM-TEMP units should restore the STATUS LEDs on both units to continuous green illumination.
2) Verify Power System output voltage is as required by the temperature of the battery. Refer to the Power System documentation for details.

### Checking the Fail Alarm

1) Unplug any temperature probe from the SM-TEMP.
   a) **Requirement:** The STATUS LED flashes RED.
   b) **Requirement:** External fail alarms activate (if connected).
2) Unplug all temperature probes from all SM-TEMP units
   a) **Requirement:** Power System output voltage switches to a default setting of approximately 54.48 volts DC.
3) Plug all temperature probes into the SM-TEMP.
   a) **Requirement:** The STATUS LED illuminates GREEN.
   b) **Requirement:** External fail alarms reset (if connected).
   c) **Requirement:** Control of Power System output voltage is returned to temperature probe(s) (see Power System documentation).



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# CONTROLS AND INDICATORS

The STATUS LED on the SM-TEMP indicates possible trouble conditions in the SM-TEMP.

- **STATUS LED Does Not Illuminate:** A fault in the SM-TEMP is indicated. Check for proper input voltage (18-60 VDC) and polarity at terminals 1 (+) and 2 (–) of TB2 or TB3 on the SM-TEMP. Correct as required.
- **STATUS LED flashes RED:** Open or short condition in probe is indicated. Check to ensure that at least one temperature probe is connected to the SM-TEMP.
- **STATUS LED illuminates GREEN:** Normal operation is indicated.

| Type | Color | Description |
|---|---|---|
| LED | Green | Module is powered and OK |
| | Flashing Green | Module is powered, operating correctly, and has all temperature sensors operating correctly, but two modules on the same CAN bus have the same address. |
| | Red | Module is powered but not operating correctly. |
| | Flashing Red | Module is powered and operating correctly, but one or more temperature sensors has failed or has been unplugged. To clear the alarm from failed or unplugged temperature sensors, toggle S1-1 three times in rapid succession. |
| | Off | Module is not powered. |

Table 3
Status Indicators

# OPERATING PROCEDURES

Operation of the SM-TEMP is completely automatic, and User intervention should not be required.

# ADJUSTMENTS

Other than the initial setting of the maximum temperature / average temperature switch and the address switches, no adjustment of the SM-TEMP is required or provided. Refer to the Power System documentation for all Power System adjustment procedures.

# TROUBLESHOOTING AND REPAIR

***Note:*** *Refer to the Power System documentation for troubleshooting possible Power System or Battery Temperature Probe failures.*

The SM-TEMP contains no user-replaceable parts. No attempt should be made to open or repair the SM-TEMP. If repair is required, contact Emerson Network Power.

***Note:*** *See Table 3 for Status Information.*



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**REVISION RECORD**

| Issue | Change Number (ECO) | Description of Change |
|---|---|---|
| AA | LLP214229 | New |
| AB | LLP215397 | Updated name to SM-TEMP. |
| AC | LLP215582 | Wire colors added to Figure 3 and misc. updates. |
| AD | LLP215632 | Update 547490 graphics on cover page, page 1 and page 5 to reflect the new product label P/N 548337. |
| AE | LLP216522 | Update CAN Bus Linear Topology. |
| AF | LLP216700 | Misc. updates. |



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**Energy Systems, North America**
4350 Weaver Parkway, Warrenville, IL 60555
**Toll Free:** 800-800-1280 (USA and Canada)
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